APPENDIX E

DESCRIPTION OF CERTIFICATION AND VERIFICATION EXECUTIVE ORDERS

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A. New Engine Certification

Air Resources Board (ARB or the Board) certifies engines destined for sale in California and provides the engine manufacturers with an Executive Order (EO) for each certified engine family. All new engines used in Carl Moyer Program (CMP) projects must be certified. Federally preempted engines must be certified by the United States Environmental Protection Agency (U.S. EPA) and must comply with durability and warranty requirements. For the purposes of the Carl Moyer Program, a technology granted a conditional certification by ARB is considered certified.

An example of an EO is shown in Figure E-1. The EO includes general information about the certified engine such as engine family, displacement, horsepower rating(s), intended service class, and emission control systems. It also shows the applicable certification emission standards as well as the average emission levels measured during the actual certification test procedure. For the purpose of the Carl Moyer Program, the certification emission standards are used to calculate emission reductions. The certification emission standards are shown in the row titled “STD” under the respective “FTP” column headings for each pollutant. For instance, the 11.9 liter diesel engine illustrated in Figure E-1 was certified to oxides of nitrogen (NOx) emission standard of 0.2 grams per brake horsepower-hour (g/bhp-hr), a carbon monoxide (CO) emission standard of 15.5 g/bhp-hr, and a particulate matter (PM) emission standard of 0.01 g/bhp-hr.

In the case where an EO shows emission values in the rows labeled “AVERAGE STD” and/or “FEL”, the engine is certified for participation in an averaging, banking, and trading (AB&T) program. AB&T engines (i.e., all family emission limit (FEL)-certified engines) are not eligible to participate in the CMP for new vehicle purchase projects since emission benefits from an engine certified to an FEL level are not surplus emissions.

New locomotive and marine engines are not certified by ARB; they are instead certified by the U.S. EPA. The U.S. EPA provides a Certificate of Conformity for each certified engine family. Figure E-2 is an example of a certificate of conformity for a locomotive remanufacture kit, and figure E-3 shows an example of a certificate for a new locomotive. Certificates of conformity for marine engines are similar.

Figure E-1
Example of an ARB Executive Order for Heavy-Duty On-Road Engines

California Environmental Protection Agency AIR RESOURCES BOARD		EXECUTIVE ORDER A-021-0535-1 New On-Road Heavy-Duty Engines Page 1 of 2 Pages

Pursuant to the authority vested in the Air Resources Board by Health and Safety Code Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39516 and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: The engine and emission control systems produced by the manufacturer are certified as described below for use in on-road motor vehicles with a manufacturer's GVWR over 14,000 pounds. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE [1]	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS [2]	ECS & SPECIAL FEATURES [3]	DIAGNOSTIC [6]
2010	ACEXH0729XAC	11.9	Diesel	Diesel	HHDD	DDI, TC, CAC, ECM, EGR, OC, SCR-U, PTOX	EMD

PRIMARY ENGINE'S IDLE EMISSIONS CONTROL [5]	ADDITIONAL IDLE EMISSIONS CONTROL [5]
30g	N/A

ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)
11.9	See attachment for engine models and ratings

* =not applicable; **GVWR**=gross vehicle weight rating; **13 CCR xyz**=Title 13, California Code of Regulations, Section xyz; **40 CFR 86.abc**=Title 40, Code of Federal Regulations, Section 86.abc; **L**=liter; **hp**=horsepower; **kw**=kilowatt; **hr**=hour;

[1] **CNG/LNG**=compressed/liquefied natural gas; **LPG**=liquefied petroleum gas; **E85**=85% ethanol fuel; **MF**=multi fuel a.k.a. **BF**=bi fuel; **DF**=dual fuel; **FF**=flexible fuel;

[2] **L/M/H HDD**=light/medium/heavy heavy-duty diesel; **UB**=urban bus; **HDO**=heavy duty Otto;

[3] **ECS**=emission control system; **TWC/OC**=three-way/oxidizing catalyst; **NAC**=NOx adsorption catalyst; **SCR-U / SCR-N**=selective catalytic reduction – urea / – ammonia; **WU (prefix)** =warm-up catalyst; **DPF**=diesel particulate filter; **PTOX**=periodic trap oxidizer; **HO2S/O2S**=heated/oxygen sensor; **HAFS/AFS**=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); **TBI**=throttle body fuel injection; **SFI/MFI**=sequential/multi port fuel injection; **DGI**=direct gasoline injection; **GCARB**=gaseous carburetor; **IDI/DDI**=indirect/direct diesel injection; **TC/SC**=turbo/super charger; **CAC**=charge air cooler; **EGR / EGR-C**=exhaust gas recirculation / cooled EGR; **PAIR/AIR**=pulsed/secondary air injection; **SPL**=smoke puff limiter; **ECM/PCM**=engine/powertrain control module; **EM**=engine modification; **2 (prefix)**=parallel; **(2) (suffix)**=in series;

[5] **ESS**=engine shutdown system (per 13 CCR 1956.8(a)(6)(A)1); **30g**=30 g/hr NOx (per 13 CCR 1956.8(a)(6)(C); **APS** =internal combustion auxiliary power system; **ALT**=alternative method (per 13 CCR 1956.8(a)(6)(D); **Exempt**=exempted per 13 CCR 1956 8(a)(6)(B) or for CNG/LNG fuel systems; **N/A**=not applicable (e.g., Otto engines and vehicles);

[6] **EMD**=engine manufacturer diagnostic system (13 CCR 1971); **OBD**=on-board diagnostic system (13 CCR 1971.1);

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.8; 2) the EURO and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, for this engine family. "Diesel" CO, EURO and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.8 are in parentheses.).

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.14	0.14	0.20	0.20	*	*	15.5	15.5	0.01	0.01	*	*
FEL	*	*	*	*	*	*	*	*	*	*	*	*
CERT	0.03	0.01	0.09	0.07	*	*	0.0	0.0	0.003	0.002	*	*
NTE	0.21		0.30		*		19.4		0.02		*	

[4] **g/bhp-hr**=grams per brake horsepower-hour; **FTP**=Federal Test Procedure; **EURO**=Euro III European Steady-State Cycle, including **RMCSET**=ram mode cycle supplemental emissions testing; **NTE**=Not-to-Exceed; **STD**=standard or emission test cap; **FEL**=family emission limit; **CERT**=certification level; **NMHC/HC**=non-methane/hydrocarbon; **NOx**=oxides of nitrogen; **CO**=carbon monoxide; **PM**=particulate matter; **HCHO**=formaldehyde; **(Rev.: 2007-02-26)**

BE IT FURTHER RESOLVED: Certification to the FEL(s) listed above, as applicable, is subject to the following terms, limitations and conditions. The FEL(s) is the emission level declared by the manufacturer and serves in lieu of an emission standard for certification purposes in any averaging, banking, or trading (ABT) programs. It will be used for determining compliance of any engine in this family and compliance with such ABT programs.

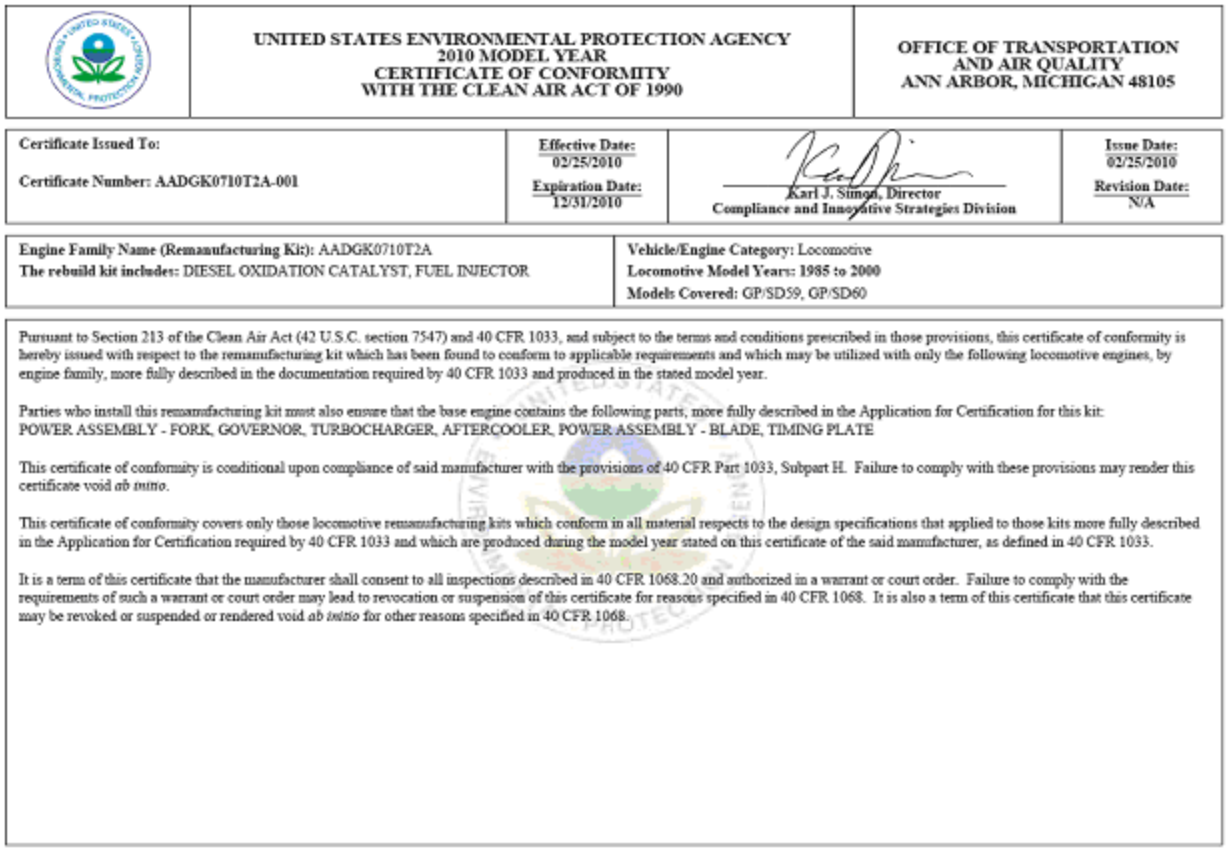
BE IT FURTHER RESOLVED: Except in vehicle applications exempted per 13 CCR 1956.8(a)(6)(B), engines in this engine family certified under 13 CCR 1956.8(a)(6)(C) [30 g/hr NOx] and section 35.B.4 of the incorporated "California Exhaust Emissions Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" (HDDE Test Procedures) adopted Dec. 12, 2002, as last amended Sep. 1, 2006, shall be provided with an approved "Certified Clean Idle" label that shall be affixed to the vehicle into which the engine is installed.

BE IT FURTHER RESOLVED: For the listed engine models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels) and 13 CCR 2035 et seq. (emission control warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

The Bureau of Automotive Repair will be notified by copy of this Executive Order.

Figure E-2
Example of U.S. EPA Certificate of Conformity for a Locomotive Engine Remanufacture Kit



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2010 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To:

Certificate Number: AADGK0710T2A-001

Effective Date: 02/25/2010
Expiration Date: 12/31/2010

Karl J. Simon, Director
Compliance and Innovative Strategies Division

Issue Date: 02/25/2010
Revision Date: N/A

Engine Family Name (Remanufacturing Kit): AADGK0710T2A
The rebuild kit includes: DIESEL OXIDATION CATALYST, FUEL INJECTOR

Vehicle/Engine Category: Locomotive
Locomotive Model Years: 1985 to 2000
Models Covered: GP/SD59, GP/SD60

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR 1033, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the remanufacturing kit which has been found to conform to applicable requirements and which may be utilized with only the following locomotive engines, by engine family, more fully described in the documentation required by 40 CFR 1033 and produced in the stated model year.

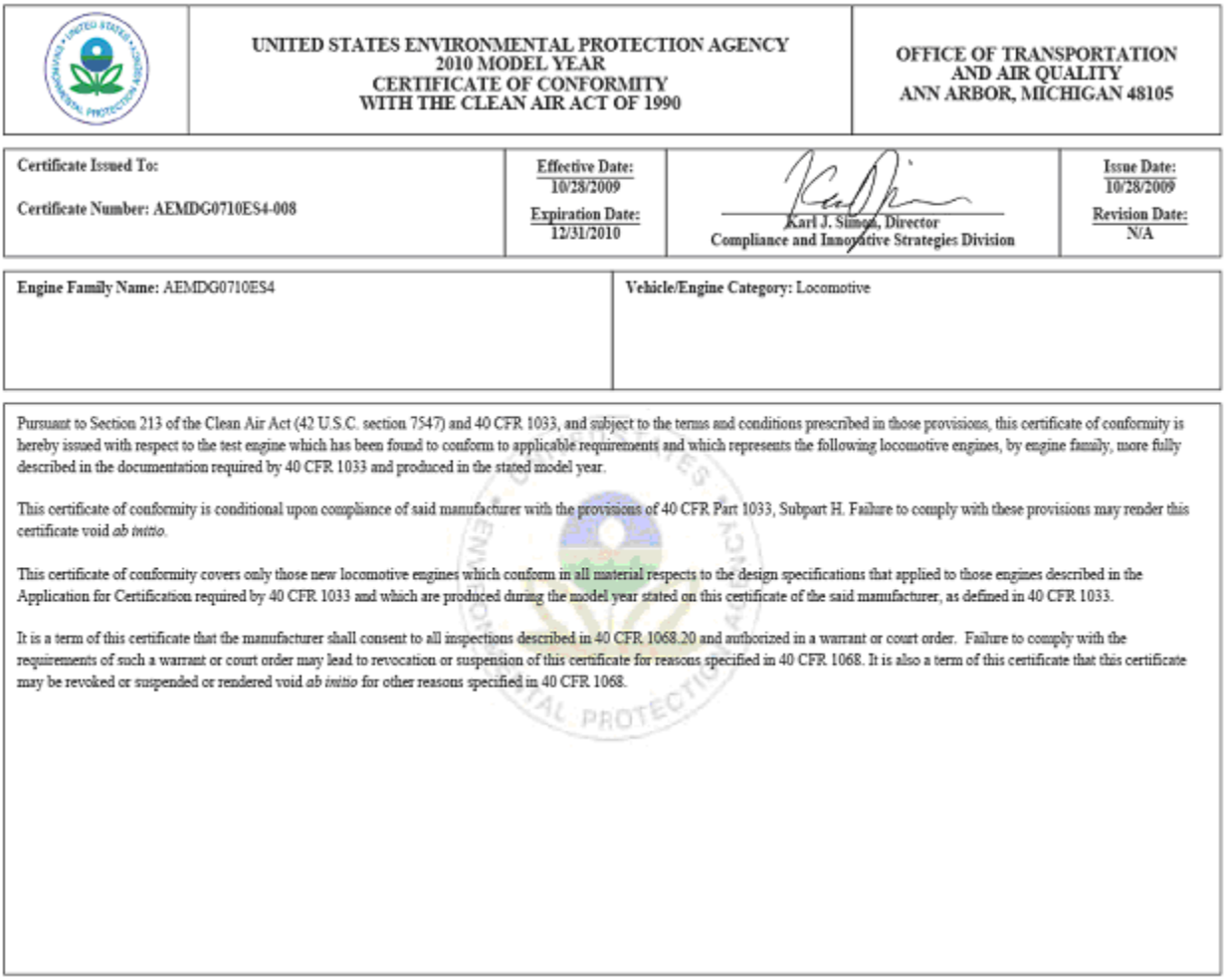
Parties who install this remanufacturing kit must also ensure that the base engine contains the following parts, more fully described in the Application for Certification for this kit: POWER ASSEMBLY - FORK, GOVERNOR, TURBOCHARGER, AFTERCOOLER, POWER ASSEMBLY - BLADE, TIMING PLATE

This certificate of conformity is conditional upon compliance of said manufacturer with the provisions of 40 CFR Part 1033, Subpart H. Failure to comply with these provisions may render this certificate void *ab initio*.

This certificate of conformity covers only those locomotive remanufacturing kits which conform in all material respects to the design specifications that applied to those kits more fully described in the Application for Certification required by 40 CFR 1033 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR 1033.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR 1068. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR 1068.

Figure E-3
Example of U.S. EPA Certificate of Conformity for a New Locomotive Engine



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2010 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To:

Certificate Number: AEMDG0710ES4-008

Effective Date: 10/28/2009

Expiration Date: 12/31/2010

Karl J. Simon, Director
Compliance and Innovative Strategies Division

Issue Date: 10/28/2009

Revision Date: N/A

Engine Family Name: AEMDG0710ES4

Vehicle/Engine Category: Locomotive

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR 1033, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engine which has been found to conform to applicable requirements and which represents the following locomotive engines, by engine family, more fully described in the documentation required by 40 CFR 1033 and produced in the stated model year.

This certificate of conformity is conditional upon compliance of said manufacturer with the provisions of 40 CFR Part 1033, Subpart H. Failure to comply with these provisions may render this certificate void *ab initio*.

This certificate of conformity covers only those new locomotive engines which conform in all material respects to the design specifications that applied to those engines described in the Application for Certification required by 40 CFR 1033 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR 1033.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR 1068. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR 1068.

B. Retrofit System Verification

ARB's verification procedures provide a way to quantify and thoroughly evaluate the emission reduction capabilities and durability of a variety of emission control strategies as part of a retrofit in-use program. It ensures that emission reductions achieved by a control strategy are both real and durable and that production units in the field are achieving emission reductions which are consistent with their verification.

1. Diesel: ARB has a verification procedure for in-use strategies to control emissions from diesel engines (diesel emission control systems or DECS). The verification procedure requires a minimum PM reduction of at least 25 percent. If a diesel emission control strategy also reduces NOx emissions by at least 15 percent, that reduction can also be verified. Emission control strategies for diesel engines are verified based on a tiered verification classification shown in Table E-1 below. It is the responsibility of the diesel emission control strategies manufacturer to provide data to verify emission reduction claims. ARB issues EOs for verified emission control strategies destined for sale in California. An example of an EO for a retrofit emission control system for diesel engines is shown in Figure E-4.

Table E-1
Verification Levels for Diesel Emission Control Strategies

Pollutant	Emission Reduction	Classification
PM	< 25%	Not Verified
	≥ 25%	Level 1
	≥ 50%	Level 2
	≥ 85%, or ≤ 0.01 g/bhp-hr	Level 3
NOx	< 15%	Not Verified
	≥ 15%	Verified in 5% Increments

2. Large Spark-Ignition: ARB staff also has a retrofit verification procedure for large spark-ignited engines (LSI). This procedure can be used to verify retrofit systems to reduce NOx and hydrocarbon (HC) emissions from LSI engines. Emission control strategies for LSI engines are verified based on a tiered verification classification shown in Table E-2 below.

Table E-2
LSI Emission Control System Verification Levels

Classification	Percentage Reduction (HC+NOx)	Absolute Emissions (HC+NOx)
LSI Level 1 [1]	> 25%[2]	Not Applicable
LSI Level 2 [1]	> 75%[3]	3.0 g/bhp-hr[3]
LSI Level 3a [1]	> 85%[4]	0.5, 1.0, 1.5, 2.0, 2.5 g/bhp-hr
LSI Level 3b [5]	Not Applicable	0.5, 1.0, 1.5, 2.0 g/bhp-hr

[1] Applicable to uncontrolled engines only
[2] The allowed verified emissions reduction is capped at 25% regardless of actual emission test values
[3] The allowed verified reduction for LSI Level 2 is capped at 75% or 3.0 g/bhp-hr regardless of actual emission test values
[4] Verified in 5% increments, applicable to LSI Level 3a classifications only
[5] Applicable to emission-controlled engines only

Figure E-4
Example of an EO for a Retrofit Emission Control System

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER DE-08-006-02

Pursuant to the authority vested in the Air Resources Board (ARB) by the Health and Safety Code, Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code section 39515 and 39516 and Executive Order G-02-003;

Relating to Exemptions under section 27156 of the Vehicle Code, and Verification under sections 2700 through 2710 of Title 13 of the California Code of Regulations (CCR)

Advanced Emission Controls, LLC ( )
System

ARB has reviewed Cleaire's request for verification of the system (system). Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, the Executive Officer of ARB hereby finds that the system reduces emissions of diesel particulate matter (PM) consistent with a Level 3 device (greater than or equal to an 85 percent reduction), achieves a 25 percent reduction in oxides of nitrogen (NOx) emissions (Title 13, CCR, sections 2702 (f) and 2708), and is compliant with the 2009 nitrogen dioxide emissions limit. Accordingly, the Executive Officer determines that the system merits verification and, subject to the terms and conditions specified below, classifies the system as a Level 3 Plus system with a 25 percent NOx reduction for heavy-duty on-road vehicles that use heavy-duty diesel engines from the engine families listed in Attachment 1.

The aforementioned verification is subject to the following terms and conditions:

- The engine must be originally manufactured from model year 1993 through 2006 and have an engine family name listed in Attachment 1.
- The engine must be used by an on-road motor vehicle with a manufacturer's Gross Vehicle Weight Rating of over 14,000 pounds.
- The engine must not employ exhaust gas recirculation.
- The application must have a duty cycle with a temperature profile greater than 260 degrees Celsius for at least 25 percent of the time.
- The engine must be in its original certified configuration.
- The engine must not be certified to have a pre-existing original equipment manufacturer (OEM) diesel particulate filter.
- The engine must not be certified to have a pre-existing OEM diesel oxidation catalyst.
- The engine must be certified for on-road applications at a PM emission level of at most 0.1 grams per brake horsepower-hour (g/bhp-hr), and greater than 0.01 g/bhp-hr.
- The engine must have a four-stroke combustion cycle.

- The engine must be turbocharged.
- The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- The end-user must monitor and keep accurate records of the engine's oil consumption rate for the duration of time that the Longview™ is installed. These records must be readily available to ARB or the system manufacturer upon request.
- Lube oil, or other oil, must not be mixed with the fuel.
- The engine must be operated on fuel that has a sulfur content of no more than 15 parts per million by weight.
- The system must not be operated with fuel additives, as defined in section 2701 of Title 13 of the CCR, unless explicitly verified for use with the fuel additive(s).
- The system must not be used with any other systems or engine modifications without ARB and manufacturer's approval.
- The other terms and conditions specified below.

IT IS ALSO ORDERED AND RESOLVED: That installation of the system, manufactured by , has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore, the system is exempt from the prohibitions in section 27156 of the Vehicle Code for installation on heavy-duty on-road vehicles using engines listed in Attachment 1. This exemption is only valid provided the engines meet the aforementioned conditions.

The system consists of a lean NOx catalyst, secondary fuel injection system, electronic controller, control sensors, and a catalyzed passive diesel particulate filter. The fuel injection system includes a fuel pump, injector, injector block, and a pressure regulator. The sensors include a manifold absolute pressure sensor, engine speed sensor, two exhaust temperature sensors, and an engine backpressure sensor. The major components of the Longview™ system are identified in Attachment 2. Schematics of the approved product and engine labels are shown in Attachment 3.

This Executive Order is valid provided that installation instructions for the Longview™ system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

must ensure that the installation of the system conforms to all applicable industrial safety requirements.

No changes are permitted to the device without the written approval of ARB. Changes from the verified design without written approval of ARB shall invalidate this Executive Order.

Changes made to the design or operating conditions of the system, as exempted by ARB, which adversely affect the performance of the vehicle's pollution control system, shall invalidate this Executive Order.

Marketing of the system using identification other than that shown in this Executive Order or for an application other than that listed in this Executive Order shall be prohibited unless prior written approval is obtained from ARB.

This Executive Order shall not apply to any system advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

A copy of this Executive Order must be provided to the ultimate purchaser at the time of sale.

The ARB estimates that the system might incur a fuel economy penalty between three and seven percent depending on the application.

As specified in section 2706 (j) (Title 13, CCR) of the Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines (Procedure), ARB assigns each Diesel Emission Control Strategy a family name. The designated family name for the verification as outlined above is:

CA/CLE/2008/PM3+/N25/ON/LNF01

As stated in the Procedure, is responsible for recordkeeping requirements (section 2702), honoring the required warranty (section 2707), and conducting in-use compliance testing (section 2709).

This Executive Order is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, sections 2281 and 2282, and if biodiesel is used, the biodiesel blend shall be 20 percent or less subject to the following conditions:

- The biodiesel portion of the blend complies with the American Society for Testing and Materials specification D6751 applicable for 15 parts per million sulfur content; and
- The diesel fuel portion of the blend complies with Title 13, CCR, sections 2281 and 2282.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this Executive Order.

In addition to the foregoing, ARB reserves the right in the future to review this Executive Order and the exemption and verification provided herein to assure that the exempted and verified add-on or modified part continues to meet the standards and procedures of Title 13, CCR, section 2222, et seq and Title 13, CCR, sections 2700 through 2710.

Systems verified under this Executive Order shall conform to all applicable California emissions regulations.

This Executive Order does not release from complying with all other applicable regulations.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order.

This Executive Order hereby supersedes Executive Order DE-08-006-01 (dated February 27, 2009) and Executive Order DE-08-006 (dated December 9, 2008).

Executed at El Monte, California, and effective this 14th day of January 2010.

Robert H. Cross, Chief
Mobile Source Control Division

Attachment 1: ARB Approved Engine Families for the
Attachment 2: Parts List for the
Attachment 3: Labels for the